October 7, 2008

Mr. Jerry Wickham
Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: **SVE/DPE Pilot Test Report**
Former Shell Service Station
1230 14th Street
Oakland, California
Fuel Leak Case No. RO0000433

Dear Mr. Wickham:

On behalf of property owner Andy Saberi, Pangea Environmental Services, Inc., has prepared this *SVE/DPE Pilot Test Report*. SVE/DPE pilot testing was proposed in our January 18, 2008 *Draft Corrective Action Plan and Pilot Test Work Plan*, and approved by Alameda County Environmental Health (ACEH) in a letter dated June 5, 2008.

If you have any questions or comments, please call me at (510) 435-8664 or email briddell@pangeaenv.com.

Sincerely,
Pangea Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

Attachment: *SVE/DPE Pilot Test Report*

cc: Andy Saberi, 1045 Airport Blvd., South San Francisco, California 94080
Denis Brown, Shell Oil Products US, 20945 S. Wilmington Avenue, Carson, CA 90810-1039
Som Gupta, c/o Carmerlengo & Johnson, 500 Airport Boulevard, Suite 230, Burlingame, CA 94010
Ana Friel, Conestoga-Rovers & Associates, 19449 Riverside Drive, Suite 230, Sonoma, CA 95476

SVE/DPE PILOT TEST REPORT

Former Shell Service Station
1230 14th Street
Oakland, California
Fuel Leak Case No. RO0000433

October 7, 2008

Prepared for:

Andy Saberi
1045 Airport Boulevard
South San Francisco, California 94080

Prepared by:

Pangea Environmental Services, Inc.
1710 Franklin Street, Suite 200
Oakland, California 94612

Written by:

REGISTERED PROFESSIONAL ENGINEER
ROBERT G. CLARK-RIDDELL
No. C 049629
Exp. SEPT 2010
CIVIL
STATE OF CALIFORNIA

for:
Brian Busch
Senior Project Scientist

Bob Clark-Riddell, P.E.
Principal Engineer

INTRODUCTION

Pangea conducted soil vapor extraction (SVE) and dual-phase extraction (DPE) pilot testing with air sparging (AS) in July 2008 at the subject site. Because prior feasibility testing has been conducted at the site, the primary purpose of this pilot testing was to provide data to facilitate selection of either SVE/AS or DPE/AS as the final remedy to target residual petroleum hydrocarbons in soil and groundwater. The testing was also performed to finalize selection of cost-effective remediation equipment and an appropriate remediation well network, and to obtain data for an air discharge permit from the Bay Area Air Quality Management District (BAAQMD). The pilot testing described herein was proposed in Pangea's January 18, 2008 *Draft Corrective Action Plan and Pilot Test Work Plan* and approved by Alameda County Environmental Health (ACEH) in a letter dated June 5, 2008. Described below are a project overview, the site background, previous environmental work, pilot test procedures, results, conclusions, and recommendations.

PROJECT OVERVIEW

Petroleum hydrocarbons were first discovered in site soil near the underground storage tanks in February 1991. Since 1991, significant site assessment and several remedial alternatives have been implemented at the subject site. The prior remediation activities have included feasibility testing of different remedial techniques, implementation of interim remedial measures (e.g., use of oxygen-releasing compounds and periodic extraction events with mobile equipment), and even implementation of a prior Corrective Action Plan (CAP). The prior CAP, in an attempt to quickly remediate residual hydrocarbons without use of a longer-term dedicated system, involved the injection of approximately 4,300 gallons of hydrogen peroxide and 138 gallons of sulfuric acid, a process known as chemical oxidation. While the extent of the hydrocarbons appears to be located primarily within *onsite* groundwater and saturated soil (soil within the water-bearing zone), previous remedial action has not sufficiently mitigated the subsurface hydrocarbon impact. The January 2008 Draft CAP and the testing described herein targets the residual hydrocarbon impact.

SITE BACKGROUND

This site background section describes the site location and layout, site history, previous environmental work, and site conditions. The site conditions subsection describes the sediment lithology, groundwater depth and flow direction, and hydrocarbon distribution in site soil and groundwater.

Site Description

The former Shell-branded service station is located at the northeast corner of the 14th Street and Union Street intersection in Oakland, California (Figure 1). Currently, an abandoned one-story station building and a pump

island canopy occupy the site, and much of the property is unpaved. Land use in the surrounding area is currently residential to the north, south, and east, and is commercial/industrial to the west and southwest. The site topography is essentially flat.

Site History

According to City of Oakland records, the current site building was constructed in 1958. Gas station operations at the site reportedly began in 1958 and ceased in 1993. Petroleum hydrocarbons were first discovered in site soil near the underground storage tanks (USTs) during the completion of three borings at the site in February 1991. Four gasoline USTs and one waste oil storage tank were removed from the site on August 24, 1993. The current property owner, Mr. Andy Saberi, purchased the property in the mid 1980's.

Previous Environmental Work

Previous environmental work has included significant site assessment, a sensitive receptor evaluation/well survey, risk evaluation, two rounds of feasibility testing (in 2000 and 2006), several rounds of interim remedial action, and even implementation of a prior CAP. Quarterly groundwater monitoring activities have been performed at the site since 1996. Previous environmental work conducted at the site between 1991 and 2006 and prior boring/well location maps were presented in Pangea's January 18, 2008 *Draft Corrective Action Plan and Pilot Test Work Plan.*

In 2007, a series of letters were prepared by Shell Oil's consultant, Mr. Saberi's consultant, and ACEH regarding site remediation. On behalf of Shell, Cambria Environmental Technology, Inc. (Cambria), of Emeryville, California submitted a *Dual-Phase Extraction Pilot Test Report and Groundwater Monitoring Report – Fourth Quarter 2006* that proposed additional interim groundwater extraction (GWE). On behalf of Mr. Saberi, Pangea Environmental Services, Inc. (Pangea), of Oakland, California, provided comments and presented a more aggressive remedial approach of DPE/AS, and did not proposed SVE based on limited vacuum influence observed during two rounds of prior testing. On May 16, 2007, Conestoga-Rovers Associates (CRA, formerly Cambria) presented a revised work plan that proposed additional feasibility testing and implementation of SVE and AS. On September 19, 2007, ACEH requested a pilot test work plan to address ACEH technical comments followed by and a CAP.

On October 31, 2007, property owner Andy Saberi assumed the role as lead responsible party for corrective action at the site. In a letter dated November 5, 2007, Pangea notified ACEH of the change in remediation lead, and recommended incorporating the pilot test into a Draft CAP to expedite site remediation. In its November 29, 2007 letter, ACEH concurred that pilot testing during a period of lower water levels was advantageous, and requested preparation of a Draft CAP / Pilot Test Work Plan. Pangea's January 18, 2008 *Draft Corrective Action Plan and Pilot Test Work Plan* was submitted to ACEH, and approved in a letter dated June 5, 2008.

Site Conditions

Sediment Lithology: Site investigations conducted to date indicate that subsurface materials encountered beneath the site consist primarily of silty sand, silty gravel, and sand to the total explored depth of 30 ft. The upper 9 to 10 ft of the filled former tank pit area consists of gravelly sand fill material. United States Geological Survey (USGS) publications and maps indicate the site is underlain by the Merritt Sand formation. Soil samples collected in March 2005 at depths of 5 and 8 feet below grade surface (ft bgs) from three onsite soil borings were submitted to a laboratory for grain size analysis, and the results indicated that the native soil type is silty to very silty sand, which is consistent with the description of the Merritt Sand formation.

Groundwater Depth and Flow Direction: Recorded groundwater depths beneath the site have ranged from 4.8 to 13.9 ft bgs. The shallowest groundwater elevations since monitoring began were observed in February and June 1998 and in March 2000. The groundwater flow direction, as calculated from depth to water measurements in onsite monitoring wells, is typically to the northeast.

Hydrocarbon Distribution in Soil and Groundwater: The primary hydrocarbon impact area is in the central portion of the site (in the vicinity of the former UST locations) and extends downgradient, as illustrated on Figure 2. The primary contaminants of concern at this site are benzene and total petroleum hydrocarbons as gasoline (TPHg), which exceeded select Environmental Screening Levels (ESLs) established by the SFRWQCB. Historical soil analytical results suggest that soil conditions have been improved by previously performed remedial activities, but elevated soil concentrations that exceed applicable ESLs were detected in all four post-remediation borings (SB-18 through SB-21) installed in 2004.

For groundwater, recent monitoring results indicate that petroleum hydrocarbon concentrations exceed applicable ESLs (final ESLs for drinking water) in ALL site monitoring and remediation wells, except for well MW-2. Petroleum hydrocarbons are well delineated in groundwater to the east and north by low aqueous-phase hydrocarbon concentrations in well MW-6 and well MW-7, respectively. Petroleum hydrocarbons are defined to the west by well MW-4 and to the south by well MW-2. Additional grab groundwater samples from *onsite* borings GP-2, GP-4 and GP-5 and *offsite* borings HA-1 through HA-4 provide additional definition of hydrocarbons in groundwater.

A primary concern for sites like this is the potential for volatile gasoline constituents (especially benzene) to intrude into indoor air where they pose a risk to human health. Benzene concentrations in site soil and groundwater exceed the ESLs protective of indoor air under the commercial site use scenario. Tabulated soil and groundwater analytical data was presented in the Draft CAP and Pilot Test Workplan.

PILOT TEST PROCEDURES

Pilot Test Overview

On July 8 through 11, 2008, Pangea performed SVE, DPE and AS pilot testing. Because prior feasibility testing has been conducted at the site, the primary purpose of this pilot testing was to provide data to facilitate selection of either SVE/AS or DPE/AS as the final remedy to target residual petroleum hydrocarbons in soil and groundwater. The testing was also performed to finalize selection of cost-effective remediation equipment and an appropriate remediation well network, and to obtain data for an air discharge permit from the Bay Area Air Quality Management District (BAAQMD).

Specific goals of SVE/DPE/AS pilot testing were to determine:

- The estimated vacuum radius of influence for SVE and DPE (and if both techniques provided adequate vacuum influence to capture vapors created by AS);
- Soil vapor extraction vacuum and flow rates during SVE and DPE (and to help evaluate if groundwater extraction is necessary to keep well screens exposed for vapor extraction);
- Vapor-phase hydrocarbon concentrations and trends in extracted vapor during SVE/AS and DPE/AS;
- Contaminant mass removal rates and the ability of AS to increase vapor-phase hydrocarbon removal rates; and
- Groundwater extraction rates during DPE (in event groundwater extraction is necessary to keep well screens exposed for vapor extraction or to further dewater the site to target deeper hydrocarbon-impacted soil).

Pilot Test Equipment

To conduct SVE and DPE testing, a trailer-mounted 25-horsepower liquid-ring vacuum pump and thermal oxidizer was used to extract and treat soil vapor from selected site wells. The 25-horsepower liquid-ring vacuum pump was capable of achieving vacuum rates of up to 28.5 inches of mercury vacuum ("Hg) and flow rates of up to 400 cubic foot per minute (cfm). Selected site wells were chosen for SVE and DPE testing because the wells contained elevated aqueous-phase hydrocarbon concentrations. During SVE testing, soil vapor was extracted from the wells by applying vacuum to the well casing through a 2-inch diameter hose connected to a tee fitting placed on top of the well casing. During DPE testing, soil vapor and groundwater were extracted from the wells by applying vacuum to the well casings through a 1.5-inch diameter 'stinger' hose inserted through a rubber coupling installed on top of each of the well heads; the stinger was then lowered into site groundwater incrementally to maintain water flow and avoid a 'deadheading' situation (where groundwater stops flowing up the stinger). After extraction from the wells, the soil vapor (SVE) and soil vapor/groundwater (DPE) process stream passed through a vapor/liquid separator, where groundwater was separated out and soil vapor was routed to a thermal oxidizer for abatement. The vacuum pump was

powered by a generator, and the generator and oxidizer were fueled by propane stored in a 499-gallon propane tank. Extracted groundwater was pumped from the vapor/liquid separator to a 6,500-gallon water storage tank and stored onsite for future disposal.

For AS testing, a 2-horsepower reciprocating air compressor was used to provide compressed air. An adjustable flow regulator and flow meter were used to regulate air flow and pressure from the compressor to the injection well. Test well locations are shown on Figure 1.

Data Collection

SVE, DPE, and AS system operational data was collected periodically during testing. SVE/DPE data collected included SVE/DPE system hour meter readings, SVE/DPE system vapor flow and applied vacuum rates, and groundwater production rates observed during DPE testing. During AS testing, air flow rates and delivery pressures were collected. Select site wells were monitored for vacuum influence and groundwater table drawdown before and during SVE/DPE testing. Dissolved oxygen (DO) and oxidation reduction potential (ORP) measurements were also collected before, during and after SVE/DPE and AS testing. The groundwater extraction rates during DPE testing were monitored by recording the water accumulation between graduations marked on the vapor/liquid separator sight tube. Soil vapor flow was measured with a hot-wire anemometer; during SVE flow was measured on the vacuum side of the blower within a long, straight run of piping near the wellhead, while during DPE flow was measured on the pressure side of the blower. Organic vapor concentrations were measured in soil vapor during SVE/DPE testing using a Horiba MEXA 324 JU vapor analyzer. In addition, vapor samples were collected in 1-liter Tedlar bags during testing for laboratory analysis. McCampbell Analytical, Inc., of Pittsburg, California, analyzed the samples for total petroleum hydrocarbons as gasoline (TPHg) using EPA Method 8015M and benzene, toluene, ethylbenzene, and xylenes (BTEX) and MTBE using EPA Method 8021b. Laboratory analytical reports are included in Appendix A.

PILOT TEST RESULTS

Test data is summarized on Tables 1, 2 and 3 and evaluated below. The relative effectiveness of contaminant removal during testing is illustrated on Figure 3.

Soil Vapor Extraction / Air Sparge Testing

On July 8, 2008, Pangea performed SVE testing for 2.5 hours on site well DP-1, followed by 2.5 hours of SVE/AS testing on wells DP-1/AS-1. Well DP-1 is constructed with a screened interval of between 8 and 23 feet below ground surface (bgs), while well AS-1 (located approximately 14 ft away) is screened from 22 to 25 ft bgs. During SVE, soil vapor extraction flow rates ranged from 6.9 cubic feet per minute (cfm) to 10.5 cfm. The applied vacuum rates ranged from 26 to 39 inches of water (“H2O) vacuum, or approximately 2 to 3 “Hg vacuum, until the very end of the test. For most of the SVE test, the applied vacuum was limited to

approximately 40 "H2O to ensure that the extraction well screen remained exposed for vapor extraction – the exposed well screen length at test start was approximately 50 " based on the pre-test water level in extraction well DP-1. Water level measurement through a small port in the wellhead test cap for DP-1 indicated that the water level rose approximately 24" during application of the 26" H2O vacuum. Therefore, the exposed screen interval was approximately 24" during SVE testing. At the very end of the SVE/AS test, however, Pangea briefly increased the applied vacuum before significant water upwelling effectively submerged the well screen.

After approximately 2.5 hours of SVE testing from well DP-1 (and before the significant water upwelling at the end of the test), Pangea commenced air sparging (AS) in nearby well AS-1. Air was injected into well AS-1 at a constant flow rate of 3 cfm at an air pressure of approximately 20 to 25 psi. Soil vapor samples from the influent of the thermal/catalytic oxidizer were collected for laboratory analysis prior to and during sparging.

Analytical results indicate that the hydrocarbon (TPHg) concentrations in extracted vapor first decreased from 560 ppmv to 400 ppmv, then increased to 2,100 ppmv (after 1.25 hours of sparging), before decreasing dramatically to only 92 ppmv (after 2.5 hours of total sparging). The corresponding vapor-phase TPHg removal rates were approximately 1.4, 1.3, 7.1, and 0.3 pounds per day (ppd), respectively. Benzene concentrations and removal rates for extracted soil vapor exhibited similar trends. These trends suggest that AS did temporarily increase hydrocarbon removal rates, but not at the end of the SVE/AS test. The results also suggest that SVE did not adequately capture hydrocarbon vapors created by sparging. SVE test data is summarized below in Table A and in attached Table 1. Soil vapor analytical data is presented in attached Table 2.

In summary, vapor-phase hydrocarbon mass removal rates during SVE and SVE/AS testing ranged from approximately 0.31 pounds per day (ppd) to 7.07 ppd. A total of approximately 0.38 lbs of vapor-phase hydrocarbons were removed from the subsurface during SVE and SVE/AS testing. Vacuum influence data (no influence observed during SVE/AS) is discussed later in conjunction with DPE test data.

Table A – SVE and SVE/AS Test Data

Extraction Well (test phase)	Test Duration (total hours)	Applied Vacuum Range * ("H2O)	Vapor Flow Rate Range (cfm)	Water Flow Rate (gpm)	Maximum Vapor Conc. (ppmv TPHg)	Max. HC Vapor Removal Rate (lbs/day)
DP-1 (pre AS)	2.4	26-39	6.9 -10.5	NA	560	1.37
DP-1 (AS mid)	2.7	37	7.6 -10.1	NA	2,100	7.07
DP-1 (AS end)	5.1	35	10.5	NA	92	0.31
DP-1 (high vac)	minutes	20 "Hg	NM	Significant	NM	NM

* Vacuum was limited to keep well screen at least partially exposed for vapor extraction. Well screen submerged at test end.

Dual-Phase Extraction / Air Sparge Testing

DPE and DPE/AS testing was performed for a total of 31.4 hours on July 10 and 11, 2008, with DPE/AS operation continued overnight between the two test days. (Testing was delayed from July 9, 2008 to await repair of a faulty seal on the groundwater transfer pump associated with the vapor/liquid separator of the oxidizer assembly). Testing was performed primarily on site well DP-1, with brief testing performed on well DP-3. Air sparging was conducted in well AS-1. Wells DP-1 and DP-3 are screened between 8 and 23 feet bgs, with AS-1 screened from 22 to 25 ft bgs.

During DPE and DPE/AS testing, applied vacuum rates ranged from 9 to 28 inches of mercury ("Hg). Soil vapor extraction flow rates ranged from 14 cubic feet per minute (cfm) to 41 cfm. Groundwater extraction rates observed during testing ranged from a low of 0.33 gallon per minute (gpm) to a high of 7.0 gpm, with steady-state groundwater production rates of about 3.0 gpm. A total of approximately 6,000 gallons of water were extracted during the testing based on the water volume in the storage tank, yielding an average flow rate of approximately 3.2 gpm over the 31.4 hour test. Based on laboratory analytical data and extraction flow rates, vapor-phase hydrocarbon mass removal rates observed during DPE testing ranged from approximately 3.8 pounds per day (ppd) to 57.5 ppd in test wells. A total of approximately 45 lbs of vapor-phase hydrocarbons were removed from the subsurface during DPE testing. DPE test data is summarized below in Table B and in attached Table 1. Soil vapor analytical data is presented in attached Table 2.

After approximately 6.7 hours of DPE testing on well DP-1, Pangea began performing AS in nearby well AS-1 (AS was started at 1530 hours on July 10, 2008). Soil vapor samples from the influent of the thermal/catalytic oxidizer were collected for laboratory analysis prior to and immediately after initiating AS in well AS-1 (samples DP-1-DPE-B and DP-1-DPE/AS Start, respectively). During AS testing, air was injected into well AS-1 at a constant flow rate of 3 cfm, and at pressures of between 20 and 25 psi. AS was performed overnight, and on the morning of July 11, 2008, Pangea collected another soil vapor sample from the influent of the thermal/catalytic oxidizer (sample DP-1-DPE/AS End, collected at 0845 on July 11, 2008) to determine vapor-phase hydrocarbon removal rates after approximately 17 hours of AS. As shown on Table 1, the calculated vapor-phase hydrocarbon (TPHg) removal rate *doubled* soon after sparging commenced and *doubled yet again* by the end of the 17-hour DPE/AS test. These observed TPHg removal rates suggest that AS helped enhance contaminant removal rates and that DPE likely captured vapors created by AS. Since DPE also dewaters the impacted capillary fringe and saturated soil, some increased TPHg removal rates may be due to greater exposure of these impacted material by the dewatering. Test data for DPE and AS on wells DP-1 and AS-1 is summarized below in Table B and in attached Table 1. Test data for DPE on well DP-3 is summarized below in Table C and in attached Table 1. Soil vapor analytical data is presented in attached Table 2.

Table B – DPE and DPE/AS Test Data on Wells DP-1 and AS-1

Extraction Well	Test Duration (total hours)	Applied Vacuum Range ("Hg)	Vapor Flow Rate Range (cfm)	Water Flow Rate Range (gpm)	Maximum Vapor Conc. (ppmv TPHg)	Max. HC Vapor Removal Rate (lbs/day)
DP-1 (pre AS)	6.2	26-28	25-31	3.5-7.0	2,000	19.9
DP-1 (with AS)	23.2	9-28	14-32	0.33-4.0	5,600	57.5

Table C – DPE Test Data on Well DP-3

Extraction Well	Test Duration (total hours)	Applied Vacuum Range ("Hg)	Vapor Flow Rate Range (cfm)	Water Flow Rate Range (gpm)	Maximum Vapor Conc. (ppmv TPHg)	Max. HC Vapor Removal Rate (lbs/day)
DP-3 (no AS)	2.0	27-28	34-41	3.0-4.0	630	8.3

DPE vapor-phase hydrocarbon removal rates and the cumulative vapor-phase hydrocarbon removal amounts are shown on attached Figure 3.

Vacuum Influence

During SVE and DPE testing, Pangea collected vacuum radius of influence measurements from observation wells in the vicinity of the operating SVE/DPE wells. Radius of influence measurements were collected from site wells MW-1 through MW-7, and wells DP-2, DP-3, VW/MW-2 and VW/MW-4. The effective radius of vacuum influence for SVE and DPE design purposes can be based on an observed vacuum of approximately 1% to 0.1% of the vacuum applied at the extraction well. Using 1% of the applied vacuum rate is a very conservative approach, especially for sites with high applied vacuum using a liquid-ring vacuum pump. Our evaluation used 0.1% of the applied vacuum rate to define the extent at which SVE or DPE effectively captures soil vapor from the subsurface. An alternative approach to estimate effective vacuum influence relies on the measurement of *any* (e.g., >0.005 "H2O) vacuum in an observation well, since actual vacuum measurement indicates the subsurface location is under vacuum. Pangea also presents our estimated vacuum radius of influence using this approach.

SVE/AS Testing

For SVE/AS testing on July 8, 2008, Pangea collected vacuum radius of influence measurements from site wells before starting SVE testing, 2 hours after SVE test start (prior to beginning AS in well AS-1), and four hours after SVE test start (about 1.5 hours after beginning AS in well AS-1). No vacuum influence was observed in any of the wells before, during or after SVE and SVE/AS testing. It is important to note that about 1.5 hours after sparging started, *positive* air pressure (0.05 to 0.07 inches of water, or "H2O) was measured in nearby wells MW-1 and MW-5R, located approximately 15 and 25 ft from well AS-1, respectively.

Vacuum influence measurement during SVE is summarized below on Table D, which shows that no vacuum influence was observed during SVE and SVE/AS testing.

Table D – SVE Test Vacuum Influence Data

Extraction Well	Observation Well	Distance to Observation Well (ft)	Hours from test start	Applied Vacuum ("Hg)	Vacuum Influence ("H2O)	Estimated Radius of Influence based on 0.1% of applied vacuum (ft)
DP-1	MW-5R	11	2	2	0	0-10?
	MW-1	12.5	2	2	0	0-10?
	DP-2	22	2	2	0	0-10?

DPE/AS Testing

For DPE/AS testing on July 10 and 11, 2008, Pangea collected vacuum influence readings during testing on DP-1 and AS-1. During DPE testing and before sparging in well AS-1, the highest vacuum influence measurement of 0.39 "H2O was observed in observation well DP-2 during the first 60 minutes of testing, with lower readings observed in nearby wells MW-1 and MW-5R (0.10 "H2O and 0.06 "H2O, respectively). Subsequent measurements collected from well DP-2 during DPE and DPE/AS testing decreased to the pre-test background level of 0.00 "H2O. However, vacuum influence in wells MW-1 and MW-5R during the same time period increased to a maximum of 0.30 "H2O and 0.10 "H2O, respectively. After commencing AS testing, vacuum influence observed in these two wells underwent significant short-term decreases during the first 30 minutes of AS testing, but after approximately 18 hours the vacuum influence recovered to near or above pre-AS test levels. This suggests that DPE can effectively capture hydrocarbon vapors created by AS.

DPE test vacuum influence data is presented on attached Table 4. Key vacuum influence measurements during DPE testing are summarized below on Table E. Table E also shows the estimated effective radius of influence using two alternative approaches: 1) 0.1% of the applied vacuum and 2) estimated distance to measurable (>0.005 "H2O) vacuum influence. As shown on Table E, the estimated effective radius of influence during DPE ranges from 9 feet to 22 feet, using the 0.1% of applied vacuum method, and ranges from approximately 15 to 40 feet using the measurable vacuum influence method. The significant variability in the estimated influence area could be due to the effect of short-circuiting within the nearby former excavation area, or due to flow changes during site dewatering. From Table 4, we note that no vacuum influence was observed in well VW/MW-2 located 24 ft from extraction well DP-1. Given the location of well VW/MW-2, short-circuiting of vapor flow may have occurred within the former excavation area. This substantiates the rationale for the planned installation of additional extraction wells DP-4 and DP-5 around the perimeter of the former excavation area, and the planned use of new wells DP-2 and DP-3 for extraction.

We anticipate long-term DPE system operation will likely yield a larger radius of influence due to greater dewatering of the subsurface during full-scale system operation.

Table E – DPE Test Vacuum Influence Data

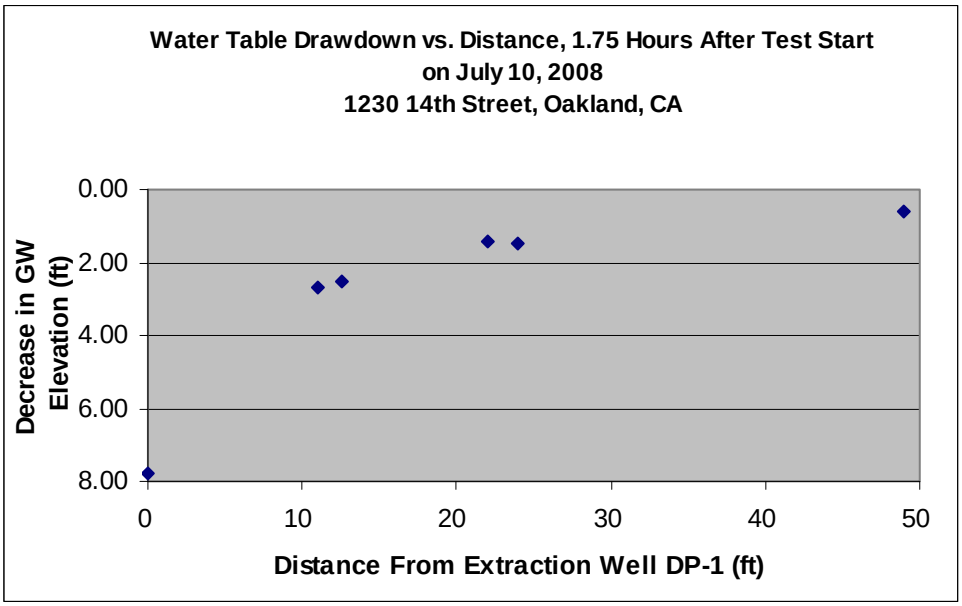
Extraction Well	Observation Well	Distance to Observation Well (ft)	Hours from test start	Applied Vacuum ("Hg)	Vacuum Influence* ("H2O)	Estimated Radius of Influence	
						0.1% of Applied Vacuum (ft)	Measurable Vacuum (ft)
DP-1	MW-5R	11	6	18	0.10	9.0†	15-20?
	MW-1	12.5	24.5	18	0.30	13	20-30?
	DP-2	22	1	16	0.39	22	30-40?

* Maximum observed vacuum influence in each observation well
† From well constructed in former UST cavity (presumably more permeable than surrounding native material)

Water Table Drawdown During DPE

Prior to the start of DPE testing, Pangea measured water levels in all site monitoring and extraction wells. Pre-test water level data was used to evaluate water table drawdown achieved during DPE testing. During DPE testing in well DP-1, the extraction 'stinger' hose was lowered incrementally to a depth of approximately 20 ft, which corresponds to a well drawdown of approximately 8 ft. The corresponding maximum water table drawdown in site wells during DPE was observed in wells MW-1 and MW-5R, located 12.5 and 11 ft away, respectively, from well DP-1. Water levels decreased approximately 2.54 ft in well MW-1, and 2.7 ft in well MW-5R after about 1.75 hours of DPE operation. A water level drawdown of at least 0.6 ft was observed in all site wells during DPE. Water level drawdown data versus distance from extraction well DP-1 is shown below on Figure A. This water drawdown was achieved after approximately 1.75 hours of DPE testing during an average water extraction rate of approximately 5.5 gpm (approximately 600 gallons of total water removal). Over the 31.4-hour DPE test, a total of approximately 6,000 gallons of water were extracted at an average flow rate of approximately 3.2 gpm. Similar to vacuum influence, we anticipate full-scale DPE system operation from several site wells will yield greater water table drawdown and further enhance vapor-phase hydrocarbon removal. Water table drawdown was not extensively evaluated during the brief (2 hour) testing of well DP-3 at the end of DPE pilot testing.

Figure A – Water Table Drawdown with Distance from Extraction Well DP-1



DO and ORP Readings

Pangea collected dissolved oxygen (DO) and oxidation-reduction potential (ORP) readings from select observation wells before, during and after site testing. DO and ORP measurements were collected to evaluate the effectiveness of AS in stimulating biodegradation of hydrocarbons in groundwater. Relative changes in DO and ORP from short-term testing can be evaluated, but measurements from long-term testing or system operation provide more reliable and representative data. Active biodegradation is indicated by inverse relationships between aqueous-phase hydrocarbon concentrations and DO and ORP.

During aerobic biodegradation, DO levels are reduced as aerobic respiration occurs. DO is the most thermodynamically favored electron acceptor used in aerobic biodegradation of hydrocarbons. Active aerobic biodegradation of BTEX compounds requires at least 1 ppm DO in groundwater, and DO concentrations can be as high as 8 to 13 ppm in oxygen-saturated groundwater that is free of hydrocarbons. Observed inverse relationships between DO and hydrocarbon concentrations indicate the occurrence of aerobic degradation, provided that at least 1 to 2 ppm of DO is present in groundwater.

The ORP of groundwater is a measure of electron activity and is an indicator of the relative tendency of a solute species to gain or lose electrons. The ORP of groundwater generally ranges from -400 millivolts (mV) to +800 mV. Under oxidizing conditions, the ORP of groundwater is positive, while under reducing conditions, the ORP is usually negative. Reducing conditions (negative ORP) suggests that anaerobic biodegradation is occurring. Generally, the ORP of groundwater inside a hydrocarbon plume should be somewhat less than that measured outside the plume.

DO and ORP data is summarized in attached Table 3. After implementing SVE/AS for a short duration, DO and ORP readings increased in *all* site wells, including more distant site perimeter wells MW-6 and MW-7 which are both located approximately 40 ft from sparge well AS-1. The elevated DO and ORP readings in wells MW-6 and MW-7 (and the lack of measurable vacuum influence) during SVE/AS testing suggest that SVE may not be effective in capturing hydrocarbon vapors generated from AS. Subsequent DO and ORP readings collected after DPE/AS testing are generally much lower than readings after SVE/AS and are near the pre-test levels. This suggests that DPE provides significantly greater control of vapors created by AS than SVE does, which is consistent with our conclusion in the vacuum influence section.

Comparison of SVE/AS and DPE/AS

To facilitate comparison of the SVE/AS and DPE/AS for site remediation, Pangea summarizes key test information below in Table F. The relative effectiveness of contaminant removal during testing shown on attached Figure 3 illustrates that DPE/AS provides significantly greater TPHg removal than SVE/AS. Based on our comparison of SVE/AS and DPE/AS, Pangea recommends implementation of DPE/AS for site remediation.

Table F – Comparison of SVE/AS and DPE/AS

Test Information	SVE/AS	DPE/AS	Evaluation
Maximum TPHg in vapor	2,100 ppmv	5,600 ppmv	About 260% greater with DPE/AS
Max TPHg removal rate	7.1 lbs/day	57.5 lbs/day	DPE/AS removal is 800% greater
Max Benzene removal rate	0.05 lbs/day	0.76 lbs/day	DPE/AS removal is 1500% greater
TPHg removal rate at test end	0.3 lbs/day	25.6 lbs/day	DPE/AS removal is 85 times greater, and was greater before reducing vacuum
DO, ORP Effect	Uncontrolled	Controlled	See above discussion
Max Vapor Flow Rate	10.5 cfm	32 cfm	More flow with DPE as expected
Applied Vacuum	3 “Hg	28” Hg	SVE applied vacuum limited by available well screen above water table
Vacuum Influence	No observed (some positive pressure)	15’- 40’?	DPE provided vacuum influence while no influence measured during SVE
Recommended Approach	No	**Yes**	**DPE/AS significantly more effective**

PILOT TEST CONCLUSIONS

Based on the above feasibility test results and comparison of SVE/AS with DPE/AS, Pangea offers the following conclusions:

- SVE/AS does *not* appear to be an appropriate remedial technology because of the low observed vapor-phase hydrocarbon removal rates at test end and the lack of measurable vacuum influence. Also, due to water upwelling, only a limited vacuum can be applied during SVE at this site. AS did briefly increase vapor-phase hydrocarbon removal rates, but removal rates dramatically decreased by the end of the short-term SVE/AS test. Finally, positive air pressure measured in some observation wells and elevated DO and ORP readings in two wells located 40 ft from sparge well AS-1 suggests that SVE did not adequately control the effects of AS.

- DPE/AS is a very appropriate remedial technology for this site. While DPE provided reasonable hydrocarbon removal rates, these removal rates increased with AS. The calculated vapor-phase hydrocarbon (TPHg) removal rate *doubled* soon after sparging commenced and *doubled yet again* by the end of the 17-hour DPE/AS test. These observed TPHg removal rates suggest that AS helped enhance contaminant removal rates, and that DPE likely captured vapors created by AS. Since DPE also dewaters the impacted capillary fringe and saturated soil, some increased TPHg removal rates may be due to greater exposure of these impacted areas by the dewatering. Finally, vacuum influence data suggests that the well network proposed in the Draft CAP is sufficient to implement DPE/AS at the site.

- Hydrocarbon removal rates and water table drawdown information indicates that DPE with an aboveground vacuum pump can effectively dewater subsurface soils for successful remediation. Long-term DPE system operation should result in an increased effective radius of influence as water levels beneath the site decrease, reducing the moisture content of subsurface soils and allowing for more efficient removal of vapor-phase hydrocarbons. Groundwater extraction rates are also expected to decrease after dewatering the former UST excavation area.

RECOMMENDATIONS

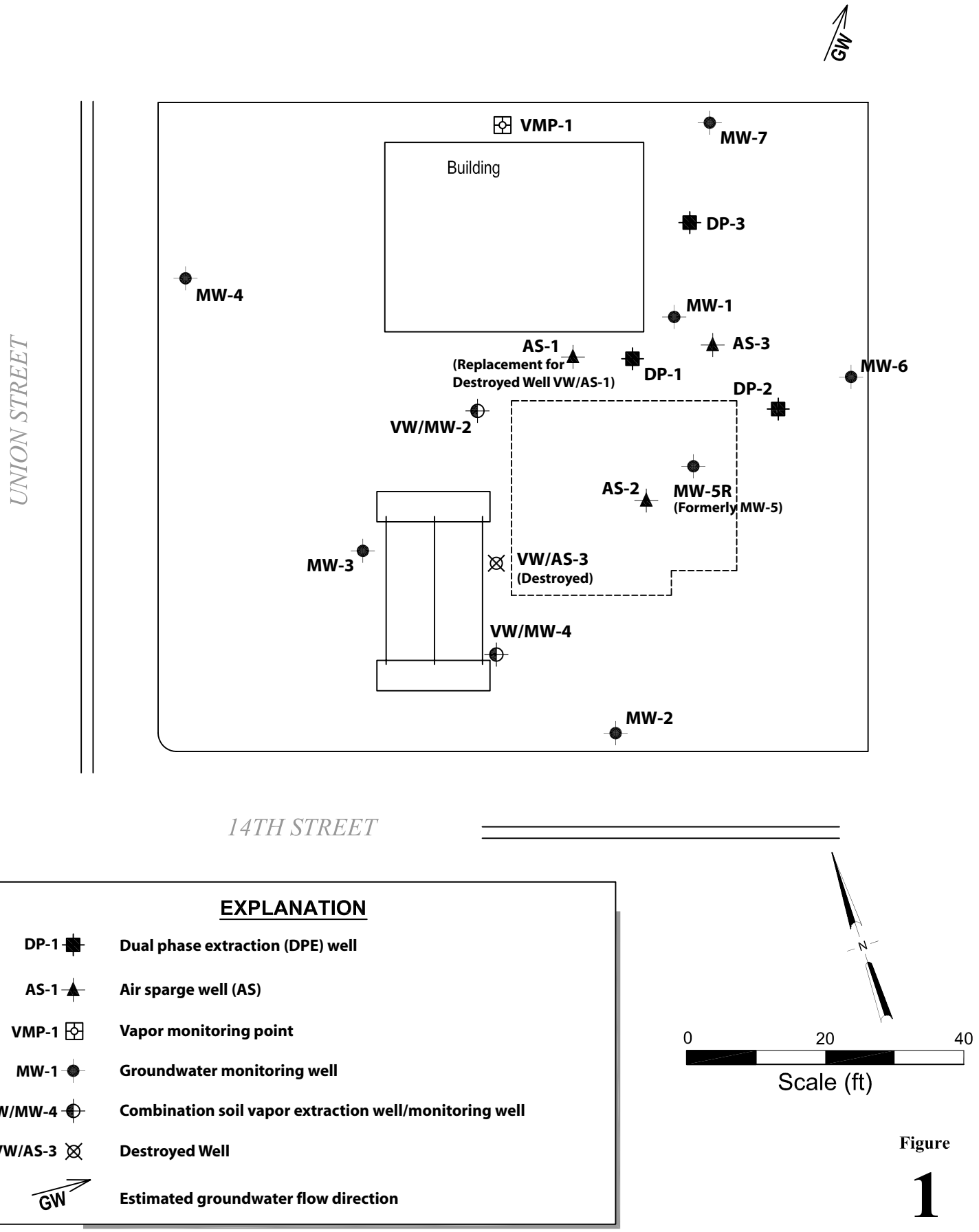
Pangea recommends implementing the DPE/AS system installation scope of work presented in our January 18, 2008 *Draft CAP and Pilot Test Work Plan.* To comply with the schedule presented in ACEH approval letter dated June 5, 2008, Pangea will commence preparation of DPE/AS system design drawings. Pangea will also commence obtaining groundwater and air discharge permits, building permits, and electrical and natural gas service for the remediation equipment. The remediation well locations, equipment compound location and the estimated DPE and AS influence areas are presented on Figure 4. To control remediation costs, Pangea will obtain competitive bids from experienced contractors for system installation. Pangea also recommends installation of contingency remediation piping in the event that submersible pumps are employed later to enhance DPE/AS effectiveness. A transfer tank, pump, and additional controls may be required to accommodate use of submersible pumps.

ATTACHMENTS

Figure 1 – Site Map
Figure 2 – Primary Contaminant Impact Area
Figure 3 – SVE/DPE Vapor-Phase Hydrocarbon Removal Rates
Figure 4 – Planned DPE/AS Well Locations and Estimated Influence Area

Table 1 – SVE/DPE Pilot Test Performance Data
Table 2 – Soil Vapor Analytical Data
Table 3 – Groundwater Bioremediation Parameters
Table 4 – Pilot Test Vacuum Influence Data During Extraction from DP-1

Appendix A – Laboratory Analytical Reports



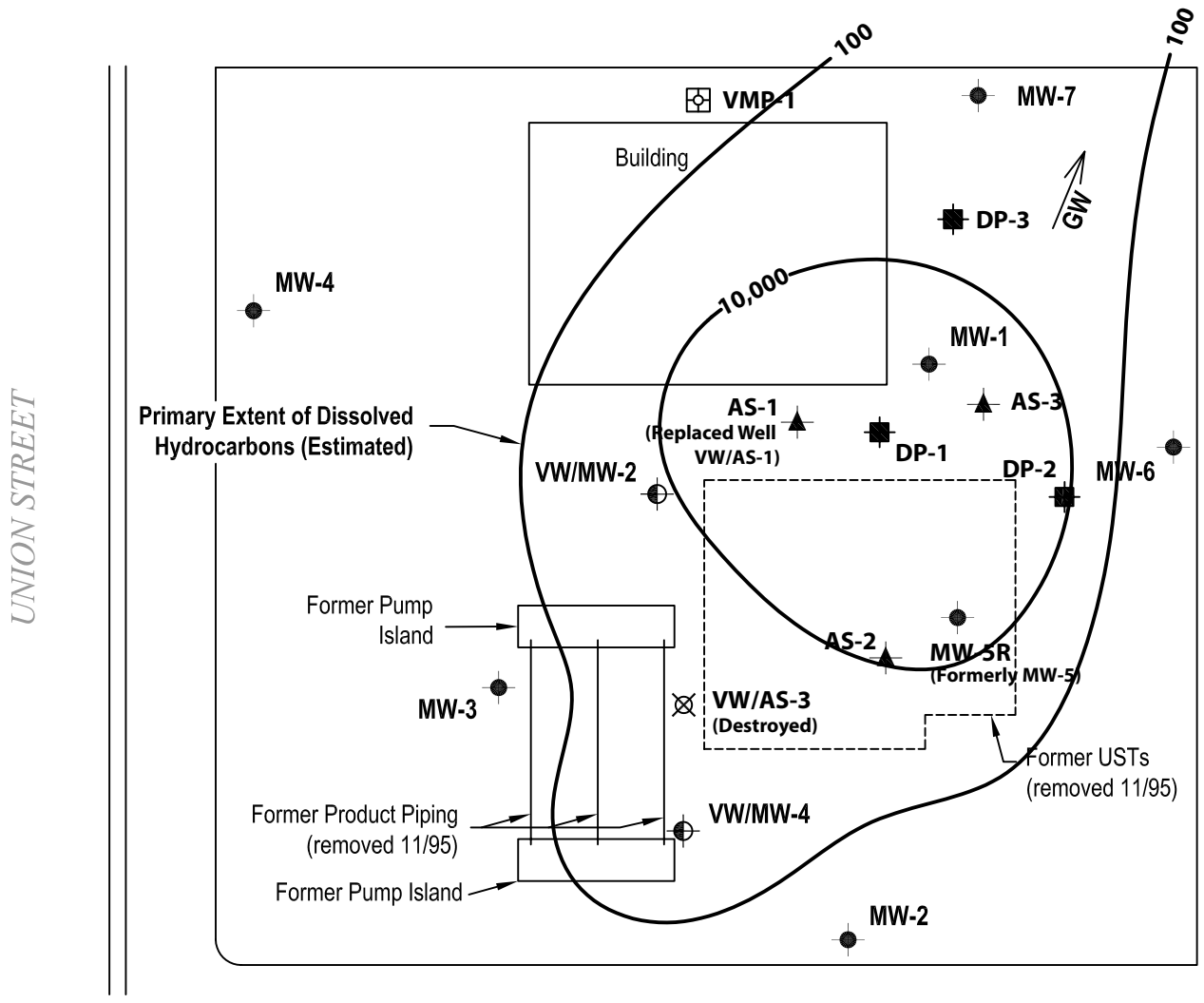
Figure

1

Former Shell Service Station
1230 14th Street
Oakland, California

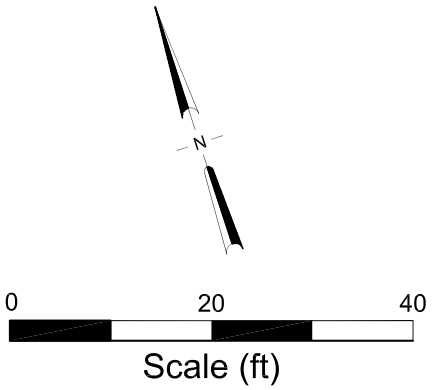
PANGEA

Site Map



EXPLANATION

DP-1	Dual phase extraction (DPE) well
AS-1	Air sparge well (AS)
VMP-1	Vapor monitoring point
MW-1	Groundwater monitoring well
VW/MW-4	Combination soil vapor extraction well/monitoring well
VW/AS-3	Combination soil vapor extraction well/air sparge well (Destroyed)
	Estimated primary extent of dissolved hydrocarbons in ppb
GW	Estimated groundwater flow direction



Figure

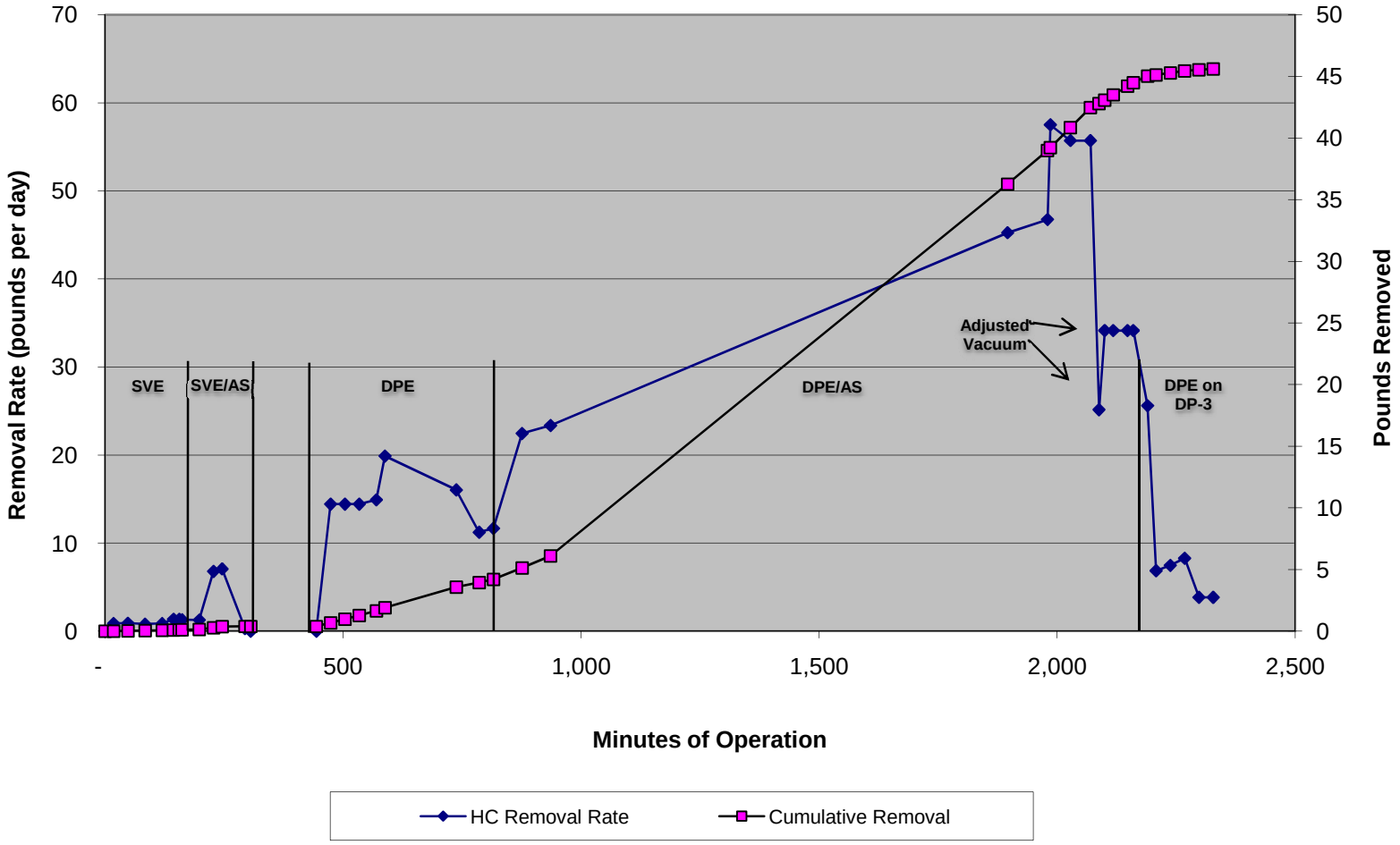
2

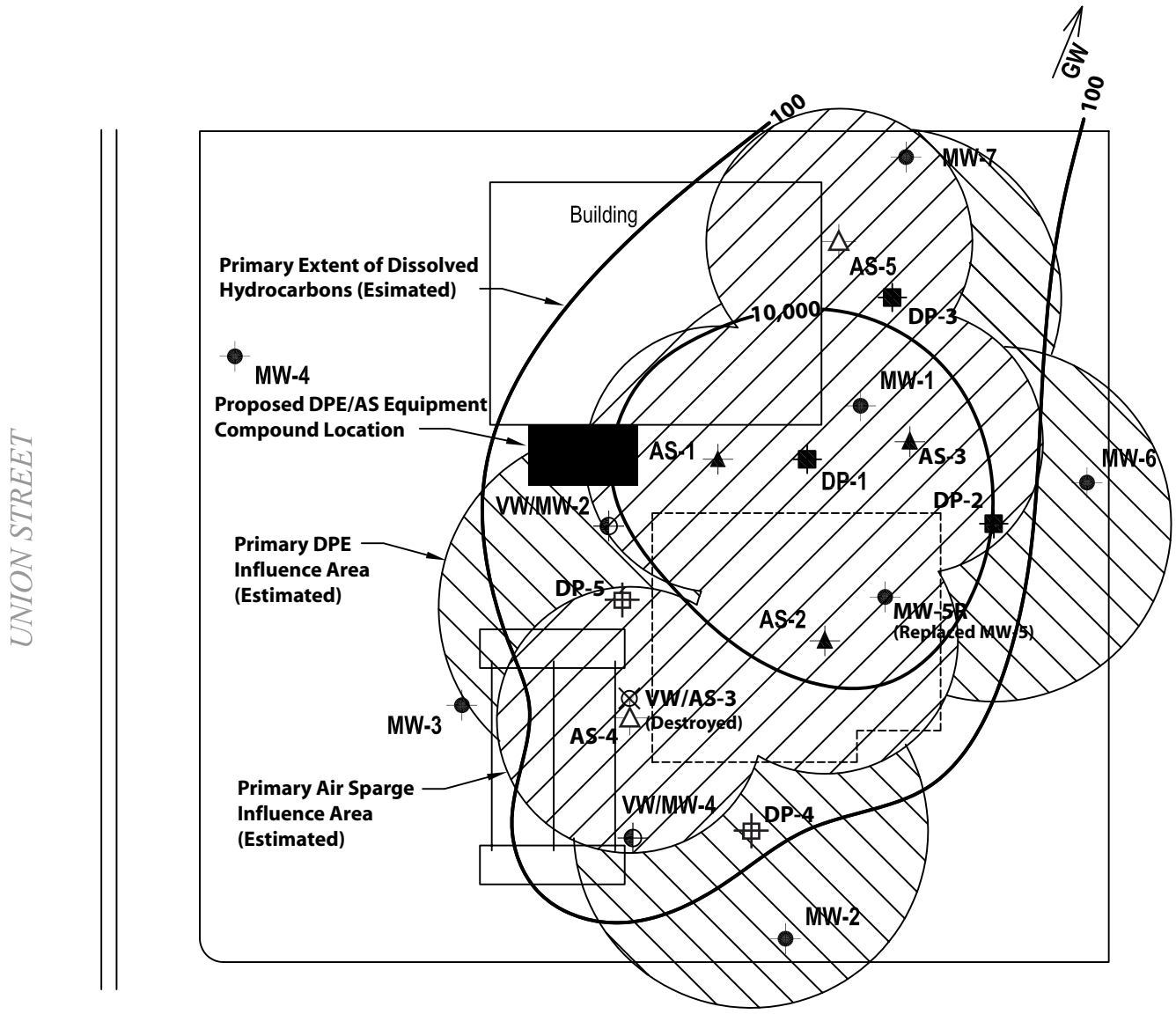
Former Shell Service Station
1230 14th Street
Oakland, California

PANGEA

Primary Contaminant Impact Area

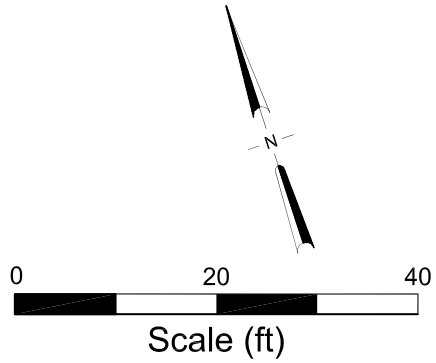
Figure 3 - SVE/DPE Vapor-Phase Hydrocarbon Removal - July 8-11, 2008
1230 14th Street, Oakland, CA





EXPLANATION

DP-1	Dual phase extraction (DPE) well
AS-1	Air sparge (AS) well
DP-4	Planned dual phase extraction (DPE) well (2 wells); estimated 20′ influence radius
AS-4	Planned air sparge well (AS) (2 wells); estimated 15′ influence radius
	Groundwater monitoring well
	Combination soil vapor extraction well/monitoring well
	Destroyed Well
	Estimated primary extent of dissolved hydrocarbons in ppb
GW	Estimated groundwater flow direction



Figure

4

Former Shell Service Station
1230 14th Street
Oakland, California

PANGEA

Planned DPE/AS Well Locations and Estimated Influence Area

Table 1 - SVE/DPE Pilot Test Performance Data - 1230 14th Street, Oakland, California

Date	Well	Hour Meter Reading (hours)	Elapsed Time (minutes)	Interval Time (minutes)	Groundwater Flow Rate (GPM)*	System Vapor Flow Rate (cfm)	Applied Vacuum	Air Sparging? (y/n)	Lab Sample ID	TPHg Lab Data (ppmv)	Benzene Lab Data (ppmv)	Influent OVA Reading (ppmv)	SVE TPHg Removal Rate (lbs/day)	SVE Benzene Removal Rate (lbs/day)	Cumulative SVE Hydrocarbon Removal (lbs)	Cumulative SVE Benzene Removal (lbs)	Notes
SVE and SVE/AS Testing from Well DP-1																	
07/08/08	DP-1	4348.3	0	0	NA	10.5	39" H2O	n	---	---	---	97	0.00	0.00	0	0	Begin SVE Testing
"	DP-1	4348.6	18	18	NA	7.6	29" H2O	n	DP-1-SVE Start	**360**	**4.6**	374	0.88	0.01	0.01	0.00	
"	DP-1	4349.1	48	30	NA	7.9	27" H2O	n	---	360	4.6	450	0.91	0.01	0.03	0.00	
"	DP-1	4349.7	84	36	NA	6.9	26" H2O	n	---	360	4.6	399	0.80	0.01	0.05	0.00	
"	DP-1	4350.3	120	36	NA	7.5	27" H2O	n	---	360	4.6	780	0.87	0.01	0.07	0.00	
"	DP-1	4350.7	144	24	NA	7.6	27" H2O	n	DP-1-PRE AS	**560**	**8.1**	660	1.37	0.02	0.09	0.00	Pre-AS data collection
"	DP-1	4350.9	156	12	NA	7.6	37" H2O	y	---	560	8.1	NM	1.37	0.02	0.11	0.00	Begin AS in well AS-1
"	DP-1	4351.0	162	6	NA	10.1	37" H2O	y	DP-1 BEGIN AS	**400**	**5.8**	467	1.30	0.02	0.11	0.00	
"	DP-1	4351.6	198	36	NA	10.0	35" H2O	y	---	400	5.8	250	1.28	0.02	0.14	0.00	
"	DP-1	4352.1	228	30	NA	10.1	35" H2O	y	DP-1-MID AS	**2,100**	**16.0**	1,617	6.80	0.05	0.28	0.00	
"	DP-1	4352.4	246	18	NA	10.5	34" H2O	y	---	2100	16.0	1,910	7.07	0.05	0.37	0.00	
"	DP-1	4353.2	294	48	NA	10.5	35" H2O	y	DP-1-AS End	**92**	**<1.4**	2,660	0.31	0.00	0.38	0.00	Collect sample at AS end
"	DP-1	4353.4	306	12	NA	NM	20" Hg	y	---	92	<1.4	NM	0.00	0.00	0.38	0.00	Upwelling during vacuum increas
DPE and DPE/AS Testing from Well DP-1 and DP-3																	
07/10/08	DP-1	4355.7	444	138	5.0	28	26" Hg	n	---	---	---	680	0.00	0.00	0.38	0.00	Begin DPE testing
"	DP-1	4356.2	474	30	7.0	30	26" Hg	n	DP-1-DPE Start	**1,500**	**30**	1,040	14.44	0.26	0.68	0.01	
"	DP-1	4356.7	504	30	5.0	30	26" Hg	n	---	1,500	30	1,925	14.44	0.26	0.99	0.01	
"	DP-1	4357.2	534	30	5.0	30	26" Hg	n	---	1,500	30	2,010	14.44	0.26	1.29	0.02	Lowered stinger to 20' bgs
"	DP-1	4357.8	570	36	4.5	31	26" Hg	n	---	1,500	30	2,290	14.92	0.27	1.66	0.03	
"	DP-1	4358.1	588	18	4.5	31	26" Hg	n	DP-1-DPE-A	**2,000**	**40**	2,320	19.89	0.36	1.91	0.03	
"	DP-1	4360.6	738	150	3.5	25	28" Hg	n	---	2,000	40	2,140	16.04	0.29	3.58	0.06	
"	DP-1	4361.4	786	48	3.5	25	28" Hg	n	DP-1-DPE-B	**1,400**	**45**	2,060	11.23	0.33	3.95	0.07	Pre-AS data collection
"	DP-1	4361.9	816	30	4.0	26	28" Hg	y	---	1,400	45	2,220	11.68	0.34	4.20	0.08	
"	DP-1	4362.9	876	60	4.0	25	28" Hg	y	DP-1-DPE/AS Start	**2,800**	**51**	2,950	22.46	0.37	5.13	0.09	Begin AS in well AS-1
"	DP-1	4363.9	936	60	3.0	26	28" Hg	y	---	2,800	51	3,860	23.36	0.39	6.11	0.11	Perform DPE overnight
07/11/08	DP-1	4379.9	1896	960	3.0	30	25" Hg	y	DP-1-DPE/AS End	**4,700**	**70**	3,740	45.24	0.61	36.26	0.52	First readings of morning
"	DP-1	4381.3	1980	84	3.0	31	26" Hg	y	---	4,700	70	3,670	46.74	0.63	38.99	0.56	
"	DP-1	4381.4	1986	6	3.0	32	26" Hg	y	DP-1-SVE 10 ft	**5,600**	**82**	4,110	57.49	0.76	39.23	0.56	Raised stinger to 10' bgs
"	DP-1	4382.1	2028	42	2.5	31	27" Hg	y	---	5,600	82	3,430	55.70	0.74	40.85	0.58	
"	DP-1	4382.8	2070	42	2.0	31	27" Hg	y	---	5,600	82	3,310	55.70	0.74	42.48	0.60	
"	DP-1	4383.1	2088	18	0.0	14	9" Hg	y	---	5,600	82	2,430	25.15	0.33	42.79	0.61	Lowered vacuum rate
"	DP-1	4383.3	2100	12	0.33	19	16" Hg	y	---	5,600	82	3,030	34.14	0.45	43.08	0.61	
"	DP-1	4383.6	2118	18	1.33	19	17" Hg	y	---	5,600	82	3,030	34.14	0.45	43.50	0.62	
"	DP-1	4384.1	2148	30	1.66	19	17" Hg	y	---	5,600	82	3,350	34.14	0.45	44.22	0.62	
"	DP-1	4384.3	2160	12	1.66	19	17" Hg	y	---	5,600	82	3,450	34.14	0.45	44.50	0.63	
"	DP-1	4384.8	2190	30	1.66	19	17" Hg	y	DP-1-SVE 10 ft End	**4,200**	**52**	3,330	25.60	0.29	45.03	0.63	End DPE/AS test on DP-1
"	DP-3	4385.1	2208	18	4.00	34	28" Hg	n	DP-3 Start	**630**	**23**	367	6.87	0.23	45.12	0.64	Beging DPE test on DP-3
"	DP-3	4385.6	2238	30	4.00	37	27" Hg	n	---	630	23	267	7.48	0.25	45.27	0.64	
"	DP-3	4386.1	2268	30	4.00	41	27" Hg	n	---	630	23	266	8.29	0.27	45.45	0.65	
"	DP-3	4386.6	2298	30	3.00	40	27" Hg	n	DP-3-End	**300**	**11**	214	3.85	0.13	45.53	0.65	
"	DP-3	4387.1	2328	30	3.00	40	27" Hg	n	---	300	11	198	3.85	0.13	45.61	0.65	End DPE test on DP-3

Notes:

* = Groundwater extraction flow rate based on sight tube observations. A total of approximately 6,000 gallons of groundwater was extracted during 31.4 hours of DPE testing (an average of approximately 3.2 gpm)

NA = not analyzed; NM = not measured

cfm = actual cubic feet per minute based on anemometer readings (from near wellhead during SVE and from pressure side of vacuum pump during DPE

ppmv = parts per million on volume to volume basi

lbs = Pounds

"H2O = Inches of water vacuum

"Hg = Inches of mercury vacuum

SVE = Soil vapor extraction

DPE = Dual-phase extraction

OVA = Organic Vapor Analyzer (Horiba Model MEXA 324JU)

Hydrocarbon Removal/Emission Rate = Rate based on Bay Area Air Quality Management District's Manual of Procedures for Soil Vapor Extraction dated July 17, 199

Rate = lab concentration (ppmv) x system flowrate (scfm) x (1lb-mole/386 f^3) x molecular weight (86 lb/lb-mole for TPH-Gas hexane) x 1440 min/day x 1/1,000,000

Table 2. Soil Vapor Analytical Data - 1230 14th Street, Oakland, California

Extraction Well ID	Sample Date	TPHg	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
		← ppmv →						
SVE and SVE/AS Testing from well DP-1								
DP-1	07/08/08	**360**	<5.0	**4.6**	2.6	0.68	3.1	Beginning of SVE testing
	07/08/08	**560**	<10	**8.1**	5.3	1.6	4.9	
	07/08/08	**400**	<10	**5.8**	3.4	1.2	3.8	Begin AS
	07/08/08	**2,100**	<20	**16**	8.5	2.9	7.8	
	07/08/08	**92**	<1.4	**0.64**	0.49	0.28	0.79	End of SVE/AS testing
DPE and DPE/AS Testing from Well DP-1 and DP-3								
DP-1	07/10/08	**1,500**	<14	**30**	17	3.2	9.4	Beginning of DPE testing
	07/10/08	**2,000**	<25	**40**	29	5.8	18	
	07/10/08	**1,400**	<35	**45**	32	6.8	26	
	07/10/08	**2,800**	<45	**51**	34	6.6	21	Begin AS
	07/11/08	**4,700**	<35	**70**	68	13	45	
	07/11/08	**5,600**	<45	**82**	87	16	55	Stinger raised to 10 ft bgs
	07/11/08	**4,200**	<35	**52**	49	8.7	32	End DPE/AS test on DP-1
DP-3	07/11/08	**630**	<2.7	**23**	9.7	5.0	16	Moved stinger to DP-3
	07/11/08	**300**	<2.0	**11**	1.4	1.5	2.5	End of DPE testing

ABBREVIATIONS AND NOTES

< = Not detected at or above indicated detection limit

Concentrations in **bold** exceed commercial soil gas ESLs

ppmv = parts per million by volume

TPHg = Total Petroleum Hydrocarbons as Gasoline by modified EPA Method 8015C

Benzene, Toluene, Ethylbenzene, and Xylenes by EPA Method 8021B

MTBE = Methyl tert-butyl ether by EPA Method 8021B

Table 3. Groundwater Bioremediation Parameters - 1230 14th Street, Oakland, CA

Well ID	Pre-Test (7/8/08)		Post-SVE/AS (7/8/08)		Post-DPE (7/10/08)		Post-DPE/AS (7/11/08)	
	DO (mg/L)	ORP (mV)	DO (mg/L)	ORP (mV)	DO (mg/L)	ORP (mV)	DO (mg/L)	ORP (mV)
MW-1	2.14	-57	4.3	-6	2.95	-41	2.41	-6
MW-5R	1.67	-96	2.65	-79	1.52	-65	1.39	-75
MW-6	2.7	-20	3.63	146	2.84	43	3.08	-4
MW-7	2.97	8	4.9	30	5.17	18	4.57	209
DP-1	1.60	-64	3.14	8	NM	NM	NM	NM
DP-2	1.95	53	3.56	-43	2.12	-22	1.6	-56
DP-3	1.81	43	2.44	17	1.32	-18	1.5	93
VW/MW-2	1.56	-86	2.7	-2	1.80	-17	1.32	-39

Abbreviations and Methods:

mg/L = milligrams per Liter

mV = milliVolts

Dissolved Oxygen and Oxidation Reduction Potential measured in the field

DO = Dissolved Oxygen

ORP = Oxidation Reduction Potential

APPENDIX A

Laboratory Analytical Reports

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Web: www.mccampbell.com E-mail: main@mccampbell.com
Telephone: 877-252-9262 Fax: 925-252-9269

Pangea Environmental Svcs., Inc. 1710 Franklin Street, Ste. 200 Oakland, CA 94612	Client Project ID: # 1150.001; Saberi-1230 14th	Date Sampled: 07/08/08
		Date Received: 07/09/08
	Client Contact: Brian Busch	Date Reported: 07/16/08
	Client P.O.:	Date Completed: 07/11/08

WorkOrder: 0807238

July 16, 2008

Dear Brian:

Enclosed within are:

1) The results of the **5** analyzed samples from your project: **# 1150.001; Saberi-1230 14th,**
2) A QC report for the above samples,
3) A copy of the chain of custody, and
4) An invoice for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits.

If you have any questions or concerns, please feel free to give me a call. Thank you for choosing

McCampbell Analytical Laboratories for your analytical needs.

Best regards,

Angela Rydelius
Laboratory Manager
McCampbell Analytical, Inc.

0807238

McCAMPBELL ANALYTICAL, INC.

110 2nd AVENUE SOUTH, #D7
PACHECO, CA 94553-5560
Website: www.mccampbell.com Email: main@mccampbell.com
Telephone: (925) 798-1620 Fax: (925) 798-1622

CHAIN OF CUSTODY RECORD

TURN AROUND TIME ☐ RUSH ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAY

EDF Required? Coelt (Normal) No Write On (DW) No

Report To: Brian Busch	Bill To: Pangea
Company: Pangea Environmental Services, Inc.	
1710 Franklin Street, Suite 200, Oakland, CA 94612	
Brian Busch	E-Mail: bbusch@pangaea.com
Tele: (510) 836-3702	Fax: (510) 836-3709
Project #: 1150.001	Project Name: Saberi - 1230 14th
Project Location: 1230 14th Street Oakland, California	
Sampler Signature:	

SAMPLE ID (Field Point Name)	LOCATION	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX Water	Soil	Air	Sludge	Other	METHOD PRESERVED ICE	HCL	HNO_3	Other	BTEX & TPH as Gas (602/8020 + 8015)/MTBE	TPH as Diesel (8015)	Total Petroleum Oil & Grease (5520 E&F/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 601 / 8010 / 8021	BTEX ONLY (EPA 602 / 8020)	EPA 608 / 8081	EPA 608 / 8082 PCB's ONLY	EPA 8140 / 8141	EPA 8150 / 8151	EPA 524.2 / 624 / 8260	EPA 525 / 625 / 8270	PAH's / PNA's by EPA 625 / 8270 / 8310	CAM-17 Metals (6010 / 6020)	LUFT 5 Metals (6010 / 6020)	Lead (200.8 / 200.9 / 6010)	Other	Other	Other	Comments
DP-1@SVE start	1230 14th	7-8-08	1235	1	Bag			X						X	X																			PPMV
DP-1-Pre AS	Street	"	1430	"	"			"						"	"																			"
DP-1-Begin AS	Oakland	"	1500	"	"			"						"	"																			"
DP-1-Mid AS	"	"	1600	"	"			"						"	"																			"
DP-1-AS END	"	"	1700	"	"			"						"	"																			"

Air samples stored in cooler overnight

Relinquished By:	Date: 7/9	Time: 1112	Received By:
Relinquished By:	Date: 7/9/08	Time: 1825	Received By: K. Burke
Relinquished By:	Date:	Time:	Received By:

ICE/t° NR
GOOD CONDITION
HEAD SPACE ABSENT
DECHLORINATED IN LAB
APPROPRIATE CONTAINERS
PRESERVED IN LAB

COMMENTS: Report Results in ppmv please!

	VOAS	O&G	METALS	OTHER
PRESERVATION			pH<2	

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 0807238 **ClientCode: PEO**

☐ WriteOn ☑ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
Brian Busch
Pangea Environmental Svcs., Inc.
1710 Franklin Street, Ste. 200
Oakland, CA 94612
(510) 836-3700 FAX (510) 836-3709

Email: bbusch@pangeaenv.com
cc:
PO:
ProjectNo: # 1150.001; Saberi-1230 14th

Bill to:
Bob Clark-Riddell
Pangea Environmental Svcs., Inc.
1710 Franklin Street, Ste. 200
Oakland, CA 94612

Requested TAT: 5 days

Date Received: **07/09/2008**
Date Printed: **07/09/2008**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
0807238-001	DP-1@SVE start	Air	7/8/2008 12:35	☐	A	A										
0807238-002	DP-1-PRE AS	Air	7/8/2008 14:30	☐	A											
0807238-003	DP-1-BEGIN AS	Air	7/8/2008 15:00	☐	A											
0807238-004	DP-1-MID AS	Air	7/8/2008 16:00	☐	A											
0807238-005	DP-1-AS END	Air	7/8/2008 17:00	☐	A											

Test Legend:

1	G-MBTEX_AIR	2	PREDF REPORT	3		4		5	
6		7		8		9		10	
11		12							

The following SampIDs: 001A, 002A, 003A, 004A, 005A contain testgroup.

Prepared by: Kimberly Burks

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Web: www.mccampbell.com E-mail: main@mccampbell.com
Telephone: 877-252-9262 Fax: 925-252-9269

Sample Receipt Checklist

Client Name: **Pangea Environmental Svcs., Inc.**

Date and Time Received: **7/9/2008 8:21:45 PM**

Project Name: **# 1150.001; Saberi-1230 14th**

Checklist completed and reviewed by: Kimberly Burks

WorkOrder N°: **0807238** Matrix Air

Carrier: Michael Hernandez (MAI Courier)

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☑	No ☐

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp:		NA ☑
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	No VOA vials submitted ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
TTLC Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑

** NOTE: If the "No" box is checked, see comments below.*

Client contacted: Date contacted: Contacted by:

Comments:

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Pangea Environmental Svcs., Inc.	Client Project ID: # 1150.001; Saberi-1230 14th	Date Sampled: 07/08/08
		Date Received: 07/09/08
1710 Franklin Street, Ste. 200	Client Contact: Brian Busch	Date Extracted: 07/10/08
Oakland, CA 94612	Client P.O.:	Date Analyzed 07/10/08

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0807238

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	DP-1@SVE start	A	1300,d1	ND<20	15	10	3.0	13	4	112
002A	DP-1-PRE AS	A	2000,d1	ND<30	26	20	6.9	22	4	107
003A	DP-1-BEGIN AS	A	1400,d1	ND<30	19	13	5.3	17	6.7	125
004A	DP-1-MID AS	A	7700,d1	ND<65	52	32	13	34	10	110
005A	DP-1-AS END	A	330,d1	ND<5.0	2.1	1.9	1.2	3.5	2	116

Reporting Limit for DF =1; ND means not detected at or	A	50	5.0	0.5	0.5	0.5	0.5	µg/L
	S	1.0	0.05	0.005	0.005	0.005	0.005	mg/Kg

* water and vapor samples are reported in µg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:

d1) weakly modified or unmodified gasoline is significant

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

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Pangea Environmental Svcs., Inc.	Client Project ID: # 1150.001; Saberi-1230 14th	Date Sampled: 07/08/08
		Date Received: 07/09/08
1710 Franklin Street, Ste. 200	Client Contact: Brian Busch	Date Extracted: 07/10/08
Oakland, CA 94612	Client P.O.:	Date Analyzed: 07/10/08

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX in ppmv*

Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0807238

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	DP-1@SVE start	A	360,d1	ND<5.0	4.6	2.6	0.68	3.1	4	112
002A	DP-1-PRE AS	A	560,d1	ND<10	8.1	5.3	1.6	4.9	4	107
003A	DP-1-BEGIN AS	A	400,d1	ND<10	5.8	3.4	1.2	3.8	6.7	125
004A	DP-1-MID AS	A	2100,d1	ND<20	16	8.5	2.9	7.8	10	110
005A	DP-1-AS END	A	92,d1	ND<1.4	0.64	0.49	0.28	0.79	2	116

ppm (mg/L) to ppmv (ul/L) conversion for TPH(g) assumes the molecular weight of gasoline to be equal to that of hexane.

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	A	7.0	0.68	0.077	0.065	0.057	0.057	1	uL/L
	S	NA	NA	NA	NA	NA	NA	1	mg/Kg

* vapor samples are reported in µL/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L, water samples and all TCLP & SPLP extracts are reported in µg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:

d1) weakly modified or unmodified gasoline is significant

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

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QC SUMMARY REPORT FOR SW8021B/8015Cm

W.O. Sample Matrix: Air QC Matrix: Water WorkOrder: 0807238

EPA Method SW8021B/8015Cm **Extraction SW5030B** **BatchID: 36839** **Spiked Sample ID: 0807214-009A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)			
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	RPD	LCS/LCSD	RPD
TPH(btex)£	ND	60	96.7	94.8	1.97	93.8	100	6.59	70 - 130	20	70 - 130	20
MTBE	ND	10	81.5	90.9	11.0	94.2	103	8.82	70 - 130	20	70 - 130	20
Benzene	ND	10	90.1	89.3	0.940	87.6	88.1	0.518	70 - 130	20	70 - 130	20
Toluene	ND	10	85.1	83	2.33	86.2	86	0.290	70 - 130	20	70 - 130	20
Ethylbenzene	ND	10	91.6	88.8	3.10	91.4	92.6	1.29	70 - 130	20	70 - 130	20
Xylenes	ND	30	90.1	85.3	5.49	102	103	1.04	70 - 130	20	70 - 130	20
%SS:	96	10	102	101	1.51	93	91	1.34	70 - 130	20	70 - 130	20

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

BATCH 36839 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
0807238-001A	07/08/08 12:35 PM	07/10/08	07/10/08 10:14 PM	0807238-002A	07/08/08 2:30 PM	07/10/08	07/10/08 10:48 PM
0807238-003A	07/08/08 3:00 PM	07/10/08	07/10/08 11:21 PM	0807238-004A	07/08/08 4:00 PM	07/10/08	07/10/08 8:23 PM
0807238-005A	07/08/08 5:00 PM	07/10/08	07/10/08 8:53 PM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

£ TPH(btex) = sum of BTEX areas from the FID.

cluttered chromatogram; sample peak coelutes with surrogate peak.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer

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Pangea Environmental Svcs., Inc. 1710 Franklin Street, Ste. 200 Oakland, CA 94612	Client Project ID: Saberi; 1230 14th ST, Oakland, Ca.	Date Sampled: 07/10/08
		Date Received: 07/10/08
	Client Contact: Brian Busch	Date Reported: 07/16/08
	Client P.O.:	Date Completed: 07/16/08

WorkOrder: 0807257

July 16, 2008

Dear Brian:

Enclosed within are:

1) The results of the **2** analyzed samples from your project: **Saberi; 1230 14th ST, Oakland, Ca.,**
2) A QC report for the above samples,
3) A copy of the chain of custody, and
4) An invoice for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits.

If you have any questions or concerns, please feel free to give me a call. Thank you for choosing

McCampbell Analytical Laboratories for your analytical needs.

Best regards,

Angela Rydelius
Laboratory Manager
McCampbell Analytical, Inc.

0807257

McCAMPBELL ANALYTICAL, INC.

110 2nd AVENUE SOUTH, #D7
PACHECO, CA 94553-5560
Website: www.mccampbell.com Email: main@mccampbell.com
Telephone: (877) 252-9262 Fax: (925) 798-1622

CHAIN OF CUSTODY RECORD

TURN AROUND TIME ☐ RUSH ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAY

EDF Required? Coelt (Normal) No Write On (DW) No

Report To: BRIAN BUSCH	Bill To: Pangea Environmental
Company: Pangea Environmental Services, Inc.	
1710 Franklin Street, Suite 200	
Oakland, CA 94612	E-Mail: bbusch @pangeaenv.com
Tele: 925-708-2775	Fax: (510) 836-3709
Project #:	Project Name: SABER1
Project Location: 1230 14TH ST, Oakland, CA	
Sampler Signature:	

SAMPLE ID (Field Point Name)	LOCATION	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX Water	Soil	Air	Sludge	Other	METHOD PRESERVED ICE	HCL	HNO_3	Other
DP1-DPE Start		7-10-08	0930	1				X						
DP1-DPE-A		7-10-08	1115	1				X						

Analysis Request	Other	Comments
BTEX & TPH as Gas (602/8020 + 8015)/MTBE: X, X		Filter Samples for Metals analysis: Yes / No
TPH as Diesel (8015)		report results in PPM
Total Petroleum Oil & Grease (5520 E&F/B&F)		
Total Petroleum Hydrocarbons (418.1)		
EPA 601 / 8010 / 8021		
BTEX ONLY (EPA 602 / 8020)		
EPA 608 / 8081		
EPA 608 / 8082 PCB's ONLY		
EPA 8140 / 8141		
EPA 8150 / 8151		
EPA 524.2 / 624 / 8260		
EPA 525 / 625 / 8270		
PAH's / PNA's by EPA 625 / 8270 / 8310		
CAM-17 Metals (6010 / 6020)		
LUFT 5 Metals (6010 / 6020)		
Lead (200.8 / 200.9 / 6010)		

	Date:	Time:	
Relinquished By:	7-10-08	220	Received By:
Relinquished By:	7/10/08	400	Received By: K. BURKS
Relinquished By:	Date:	Time:	Received By:

ICE/t° _____ COMMENTS:
GOOD CONDITION _____
HEAD SPACE ABSENT _____
DECHLORINATED IN LAB _____
APPROPRIATE CONTAINERS _____
PRESERVED IN LAB _____

PRESERVATION	VOAS	O&G	METALS pH<2	OTHER

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 0807257 **ClientCode: PEO**

☐ WriteOn ☑ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
Brian Busch
Pangea Environmental Svcs., Inc.
1710 Franklin Street, Ste. 200
Oakland, CA 94612
(510) 836-3700 FAX (510) 836-3709

Email: bbusch@pangeaenv.com
cc:
PO:
ProjectNo: Saberi; 1230 14th ST, Oakland, Ca.

Bill to:
Bob Clark-Riddell
Pangea Environmental Svcs., Inc.
1710 Franklin Street, Ste. 200
Oakland, CA 94612

Requested TAT: 5 days

Date Received: **07/10/2008**
Date Printed: **07/10/2008**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
0807257-001	DP1-DPE Start	Air	7/10/2008 9:30	☐	A	A										
0807257-002	DP1-DPE-A	Air	7/10/2008 11:15	☐	A											

Test Legend:

1	G-MBTEX_AIR	2	PREDF REPORT	3		4		5	
6		7		8		9		10	
11		12							

The following SampIDs: 001A, 002A contain testgroup.

Prepared by: Kimberly Burks

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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Sample Receipt Checklist

Client Name: **Pangea Environmental Svcs., Inc.**
Date and Time Received: **7/10/2008 4:58:11 PM**

Project Name: **Saberi; 1230 14th ST, Oakland, Ca.**
Checklist completed and reviewed by: Kimberly Burks

WorkOrder N°: **0807257** Matrix Air
Carrier: Rob Pringle (MAI Courier)

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☑	No ☐

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp:		NA ☑
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	No VOA vials submitted ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
TTLC Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑

** NOTE: If the "No" box is checked, see comments below.*

Client contacted: Date contacted: Contacted by:

Comments:

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Pangea Environmental Svcs., Inc.	Client Project ID: Saberi; 1230 14th ST, Oakland, Ca.	Date Sampled: 07/10/08
		Date Received: 07/10/08
1710 Franklin Street, Ste. 200	Client Contact: Brian Busch	Date Extracted: 07/10/08
Oakland, CA 94612	Client P.O.:	Date Analyzed 07/10/08

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

Extraction method SW5030B Analytical methods SW8021B/8015Cm Work Order: 0807257

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	DP1-DPE Start	A	5400,d1	ND<50	99	64	14	41	20	103
002A	DP1-DPE-A	A	7000,d1	ND<90	130	110	25	78	20	109

Reporting Limit for DF =1; ND means not detected at or	A	50	5.0	0.5	0.5	0.5	0.5	µg/L
	S	1.0	0.05	0.005	0.005	0.005	0.005	mg/Kg

* water and vapor samples are reported in µg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:

d1) weakly modified or unmodified gasoline is significant

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

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Pangea Environmental Svcs., Inc.	Client Project ID: Saberi; 1230 14th ST, Oakland, Ca.	Date Sampled: 07/10/08
		Date Received: 07/10/08
1710 Franklin Street, Ste. 200	Client Contact: Brian Busch	Date Extracted: 07/10/08
Oakland, CA 94612	Client P.O.:	Date Analyzed: 07/10/08

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX in ppmv*

Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0807257

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	DP1-DPE Start	A	1500,d1	ND<14	30	17	3.2	9.4	20	103
002A	DP1-DPE-A	A	2000,d1	ND<25	40	29	5.8	18	20	109

ppm (mg/L) to ppmv (ul/L) conversion for TPH(g) assumes the molecular weight of gasoline to be equal to that of hexane.

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	A	7.0	0.68	0.077	0.065	0.057	0.057	1	uL/L
	S	NA	NA	NA	NA	NA	NA	1	mg/Kg

* vapor samples are reported in µL/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L, water samples and all TCLP & SPLP extracts are reported in µg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:

d1) weakly modified or unmodified gasoline is significant

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

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QC SUMMARY REPORT FOR SW8021B/8015Cm

W.O. Sample Matrix: Air QC Matrix: Water WorkOrder 0807257

EPA Method SW8021B/8015Cm **Extraction SW5030B** **BatchID: 36861** **Spiked Sample ID: 0807240-001A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)			
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	RPD	LCS/LCSD	RPD
TPH(btex)£	ND	60	90.7	103	12.3	101	101	0	70 - 130	20	70 - 130	20
MTBE	ND	10	86	85.1	1.07	91.1	99.1	8.42	70 - 130	20	70 - 130	20
Benzene	ND	10	88.3	89.7	1.53	92.2	97	5.05	70 - 130	20	70 - 130	20
Toluene	ND	10	87.3	90.1	3.23	84.4	85.6	1.49	70 - 130	20	70 - 130	20
Ethylbenzene	ND	10	87.7	90.3	2.93	93	93.6	0.648	70 - 130	20	70 - 130	20
Xylenes	ND	30	83	86.3	3.91	90.7	91.4	0.802	70 - 130	20	70 - 130	20
%SS:	94	10	112	101	10.3	100	103	2.88	70 - 130	20	70 - 130	20

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

BATCH 36861 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
0807257-001A	07/10/08 9:30 AM	07/10/08	07/10/08 6:22 PM	0807257-002A	07/10/08 11:15 AM	07/10/08	07/10/08 7:22 PM

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

£ TPH(btex) = sum of BTEX areas from the FID.

cluttered chromatogram; sample peak coelutes with surrogate peak.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

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Pangea Environmental Svcs., Inc. 1710 Franklin Street, Ste. 200 Oakland, CA 94612	Client Project ID: 1230 14th St, Oakland, CA.	Date Sampled: 07/10/08-07/11/08
		Date Received: 07/11/08
	Client Contact: Brian Busch	Date Reported: 07/16/08
	Client P.O.:	Date Completed: 07/14/08

WorkOrder 0807306

July 16, 2008

Dear Brian:

Enclosed within are:

1) The results of the **7** analyzed samples from your project: **1230 14th St, Oakland, CA.,**
2) A QC report for the above samples,
3) A copy of the chain of custody, and
4) An invoice for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits.

If you have any questions or concerns, please feel free to give me a call. Thank you for choosing

McCampbell Analytical Laboratories for your analytical needs.

Best regards,

Angela Rydelius
Laboratory Manager
McCampbell Analytical, Inc.

McCAMPBELL ANALYTICAL, INC.

110 2nd AVENUE SOUTH, #D7
PACHECO, CA 94553-5560
0807306
Website: www.mccampbell.com Email: main@mccampbell.com
Telephone: (877) 252-9262 Fax: (925) 798-1622

CHAIN OF CUSTODY RECORD

TURN AROUND TIME ☐ RUSH ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAY

EDF Required? Coelt (Normal) No Write On (DW) No

Report To: BRIAN BUSCH	Bill To: Pangea Environmental
Company: Pangea Environmental Services, Inc.	
1710 Franklin Street, Suite 200	
Oakland, CA 94612	E-Mail: bbusch@pangeaenv.com
Tele: 925-708-2775	Fax: (510) 836-3709
Project #:	Project Name:
Project Location: 1230 14th St, oakland, CA	
Sampler Signature:	

SAMPLE ID (Field Point Name)	LOCATION	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX Water	Soil	Air	Sludge	Other	METHOD PRESERVED ICE	HCL	HNO_3	Other	BTEX & TPH as Gas (602/8020 + 8015)/MTBE	TPH as Diesel (8015)	Total Petroleum Oil & Grease (5520 E&F/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 601 / 8010 / 8021	BTEX ONLY (EPA 602 / 8020)	EPA 608 / 8081	EPA 608 / 8082 PCB's ONLY	EPA 8140 / 8141	EPA 8150 / 8151	EPA 524.2 / 624 / 8260	EPA 525 / 625 / 8270	PAH's / PNA's by EPA 625 / 8270 / 8310	CAM-17 Metals (6010 / 6020)	LUFT 5 Metals (6010 / 6020)	Lead (200.8 / 200.9 / 6010)	Other	Other	Other	Comments
DP-1-DPE-B		7-10-08	1430	1	bag			X							X																			PLEASE
DP-1-DPE/AS START		7-10-08	1600	1				X							X																			REPORT
DP-1-DPE/AS END		7-11-08	0845	1				X							X																			RESULTS
DP-1-SVE@10FT.		7-11-08	1025	1				X							X																			IN PPMV.
DP-1-SVE@10FT END		7-11-08	1345	1				X							X																			
DP-3 START		7-11-08	1400	1	↓			X							X																			
DP-3 END		7-11-08	1530	1	↓			X							X																			

Relinquished By:	Date:	Time:	Received By:
	7-11-08	1530	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

ICE/t° ____
GOOD CONDITION ____
HEAD SPACE ABSENT N/A
DECHLORINATED IN LAB N/A
APPROPRIATE CONTAINERS ____
PRESERVED IN LAB NO

COMMENTS:

PRESERVATION	VOAS	O&G	METALS pH<2	OTHER

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 0807306 **ClientCode: PEO**

☐ WriteOn ☑ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
Brian Busch
Pangea Environmental Svcs., Inc.
1710 Franklin Street, Ste. 200
Oakland, CA 94612
(510) 836-3700 FAX (510) 836-3709

Email: bbusch@pangeaenv.com
cc:
PO:
ProjectNo: 1230 14th St, Oakland, CA.

Bill to:
Bob Clark-Riddell
Pangea Environmental Svcs., Inc.
1710 Franklin Street, Ste. 200
Oakland, CA 94612

Requested TAT: 5 days

Date Received: **07/11/2008**
Date Printed: **07/11/2008**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
0807306-001	DP-1-DPE-B	Air	7/10/2008 14:30	☐	A	A										
0807306-002	DP-1-DPE/As Start	Air	7/10/2008 16:00	☐	A											
0807306-003	DP-1-DPE/As End	Air	7/11/2008 8:45	☐	A											
0807306-004	DP-1-Sue @ Loft	Air	7/11/2008 8:45	☐	A											
0807306-005	DP-1-Sue @ Loft End	Air	7/11/2008 13:45	☐	A											
0807306-006	DP-3 Start	Air	7/11/2008 14:00	☐	A											
0807306-007	DP-3 End	Air	7/11/2008 15:30	☐	A											

Test Legend:

1	G-MBTEX_AIR	2	PREDF REPORT	3		4		5	
6		7		8		9		10	
11		12							

The following SampIDs: 001A, 002A, 003A, 004A, 005A, 006A, 007A contain testgroup.

Prepared by: Samantha Arbuckle

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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Web: www.mccampbell.com E-mail: main@mccampbell.com
Telephone: 877-252-9262 Fax: 925-252-9269

Sample Receipt Checklist

Client Name: **Pangea Environmental Svcs., Inc.**
Date and Time Received: **7/11/2008 7:46:47 PM**

Project Name: **1230 14th St, Oakland, CA.**
Checklist completed and reviewed by: Samantha Arbuckle

WorkOrder N°: **0807306** Matrix Air
Carrier: Michael Hernandez (MAI Courier)

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☑	No ☐

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	NA ☐
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp:		NA ☑
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	No VOA vials submitted ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
TTLC Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑

** NOTE: If the "No" box is checked, see comments below.*

Client contacted: Date contacted: Contacted by:

Comments:

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Pangea Environmental Svcs., Inc.	Client Project ID: 1230 14th St, Oakland, CA.	Date Sampled: 07/10/08-07/11/08
		Date Received: 07/11/08
1710 Franklin Street, Ste. 200	Client Contact: Brian Busch	Date Extracted: 07/12/08
Oakland, CA 94612	Client P.O.:	Date Analyzed 07/12/08

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

Extraction method SW5030B Analytical methods SW8021B/8015Cm Work Order: 0807306

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	DP-1-DPE-B	A	5100,d1	ND<120	140	120	30	110	6.7	125
002A	DP-1-DPE/As Start	A	10,000,d1	ND<150	170	130	29	92	20	121
003A	DP-1-DPE/As End	A	17,000,d1	ND<140	230	260	58	200	20	107
004A	DP-1-Sue @ Loft	A	20,000,d1	ND<180	270	340	71	240	20	109
005A	DP-1-Sue @ Loft End	A	15,000,d1	ND<120	170	190	38	140	20	95
006A	DP-3 Start	A	2200,d1	ND<10	76	37	22	72	4	124
007A	DP-3 End	A	1100,d1	ND<5.0	34	5.5	6.7	11	1	108
Reporting Limit for DF =1; ND means not detected at or	A	50	5.0	0.5	0.5	0.5	0.5	µg/L		
	S	1.0	0.05	0.005	0.005	0.005	0.005	mg/Kg		

* water and vapor samples are reported in µg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:

d1) weakly modified or unmodified gasoline is significant

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Angela Rydelius, Lab Manager

McCampbell Analytical, Inc.
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Pangea Environmental Svcs., Inc.	Client Project ID: 1230 14th St, Oakland, CA.	Date Sampled: 07/10/08
		Date Received: 07/11/08
1710 Franklin Street, Ste. 200	Client Contact: Brian Busch	Date Extracted: 07/12/08
Oakland, CA 94612	Client P.O.:	Date Analyzed 07/12/08

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX in ppmv*

Extraction method SW5030B Analytical methods SW8021B/8015Cm Work Order: 0807306

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	DP-1-DPE-B	A	1400,d1	ND<35	45	32	6.8	26	6.7	125
002A	DP-1-DPE/As Start	A	2800,d1	ND<45	51	34	6.6	21	20	121
003A	DP-1-DPE/As End	A	4700,d1	ND<35	70	68	13	45	20	107
004A	DP-1-Sue @ Loft	A	5600,d1	ND<45	82	87	16	55	20	109
005A	DP-1-Sue @ Loft End	A	4200,d1	ND<35	52	49	8.7	32	20	95
006A	DP-3 Start	A	630,d1	ND<2.7	23	9.7	5.0	16	4	124
007A	DP-3 End	A	300,d1	ND<2.0	11	1.4	1.5	2.5	1	108

ppm (mg/L) to ppmv (ul/L) conversion for TPH(g) assumes the molecular weight of gasoline to be equal to that of hexane.

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	A	7.0	0.68	0.077	0.065	0.057	0.057	1	uL/L
	S	NA	NA	NA	NA	NA	NA	1	mg/Kg

* vapor samples are reported in µL/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L, water samples and all TCLP & SPLP extracts are reported in µg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:

d1) weakly modified or unmodified gasoline is significant

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

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QC SUMMARY REPORT FOR SW8021B/8015Cm

W.O. Sample Matrix: Air QC Matrix: Water WorkOrder: 0807306

EPA Method SW8021B/8015Cm	Extraction SW5030B				BatchID: 36903			Spiked Sample ID: 0807304-002A			
Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)			
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	RPD	LCS/LCSD	RPD
TPH(btex)£	ND	60	85.3	87.4	2.48	105	96.5	8.12	70 - 130	20	70 - 130	20
MTBE	ND	10	84.1	88.7	5.26	95.5	106	10.1	70 - 130	20	70 - 130	20
Benzene	ND	10	87.2	87	0.250	94.9	105	10.5	70 - 130	20	70 - 130	20
Toluene	ND	10	81.6	82.2	0.766	85.3	94.9	10.7	70 - 130	20	70 - 130	20
Ethylbenzene	ND	10	82.9	85.7	3.37	94	97.3	3.43	70 - 130	20	70 - 130	20
Xylenes	ND	30	75.2	82.9	9.67	93.7	93.4	0.298	70 - 130	20	70 - 130	20
%SS:	102	10	101	101	0	98	110	11.6	70 - 130	20	70 - 130	20

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

BATCH 36903 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
0807306-001A	07/10/08 2:30 PM	07/12/08	07/12/08 2:19 PM	0807306-001A	07/10/08 2:30 PM	07/12/08	07/12/08 2:19 PM
0807306-002A	07/10/08 4:00 PM	07/12/08	07/12/08 12:29 PM	0807306-002A	07/10/08 4:00 PM	07/12/08	07/12/08 12:29 PM
0807306-003A	07/11/08 8:45 AM	07/12/08	07/12/08 1:29 PM	0807306-003A	07/11/08 8:45 AM	07/12/08	07/12/08 1:29 PM
0807306-004A	07/11/08 8:45 AM	07/12/08	07/12/08 12:59 PM	0807306-004A	07/11/08 8:45 AM	07/12/08	07/12/08 12:59 PM
0807306-005A	07/11/08 1:45 PM	07/12/08	07/12/08 1:59 PM	0807306-005A	07/11/08 1:45 PM	07/12/08	07/12/08 1:59 PM
0807306-006A	07/11/08 2:00 PM	07/12/08	07/12/08 2:30 PM	0807306-006A	07/11/08 2:00 PM	07/12/08	07/12/08 2:30 PM
0807306-007A	07/11/08 3:30 PM	07/12/08	07/12/08 5:01 PM	0807306-007A	07/11/08 3:30 PM	07/12/08	07/12/08 5:01 PM

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

£ TPH(btex) = sum of BTEX areas from the FID.

cluttered chromatogram; sample peak coelutes with surrogate peak.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer